

## Chapter 7

### Phytochemical characterization and antibacterial evaluation of *Dinebra chinensis* (L.) P. M. Peterson & N. Snow

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**Abstract:** The present study investigated the secondary metabolites and antibacterial activity of *Dinebra chinensis*, an underutilized fodder grass. Qualitative phytochemical analysis of n-hexane, ethanolic, and aqueous extracts revealed the consistent presence of tannins and reducing sugars, whereas saponins and flavonoids were detected exclusively in the aqueous extract and alkaloids in the ethanolic extract. Minimum Inhibitory Concentration (MIC) assays against *Escherichia coli* demonstrated growth inhibition of hydroethanolic extract. These findings highlight *D. chinensis* as a promising candidate for ethnoveterinary applications and natural antimicrobial development, supporting its integration into sustainable livestock health management and grassland biodiversity conservation strategies.

**Keywords:** Antimicrobial activity, fodder grass, phytochemical screening,

#### Introduction

Grasses are among the most ecologically and economically important plant groups, forming the foundation of grassland ecosystems and serving as a critical food source for livestock and wildlife (Sethi et al., 2024; Sharma et al., 2025). They provide essential ecosystem services such as soil stabilization, carbon sequestration, and nutrient cycling, thereby supporting agricultural productivity and biodiversity conservation (Liu et al., 2022). Beyond their ecological role, many grasses are rich in bioactive compounds that contribute to ethnomedicinal practices and promote animal health by acting as natural growth promoters and disease modulators (Mishra et al., 2022; Sinha et al., 2023). The documentation and scientific evaluation of lesser-known grasses are therefore crucial for both sustainable livestock management and the discovery of plant-based therapeutic alternatives. *Dinebra chinensis*, belonging to the family Poaceae, is a relatively underexplored grass species (Behera et al., 2025). It thrives in open fields, wastelands, and

disturbed habitats, often forming a component of natural grazing lands (Behera et al., 2025).

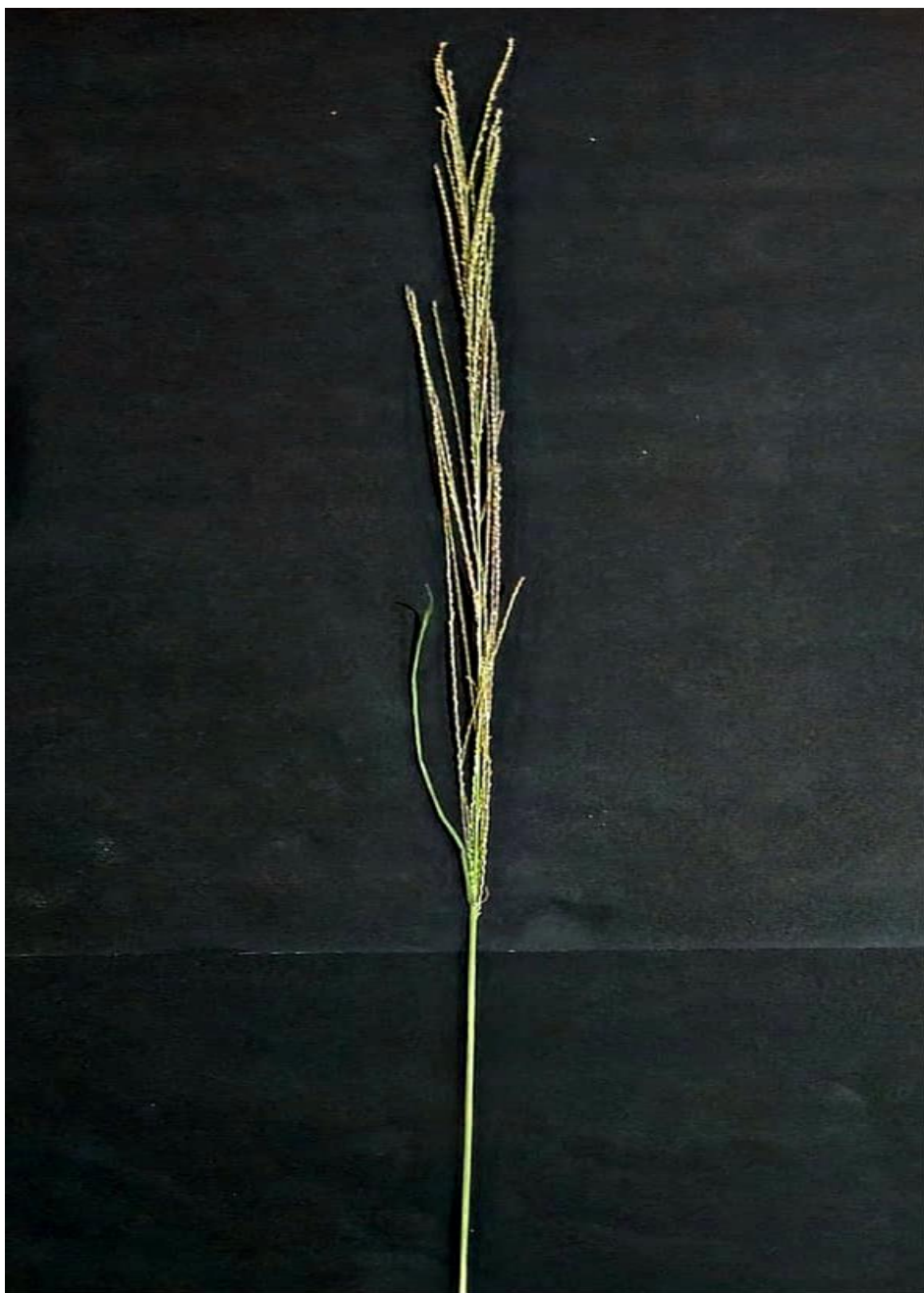


Figure 1: Collected sample of *Dinebra chinensis*

Despite its abundance, scientific literature on its nutritional and pharmacological potential remains limited. Preliminary observations suggest that *D. chinensis* may serve as a palatable fodder grass while also containing secondary metabolites of pharmacological significance, thereby offering dual benefits in terms of fodder security and natural therapeutics. Phytochemical screening of grass species provides valuable insights into their nutritional value and bioactive compound profile, which can help in developing ethnoveterinary formulations and alternative antimicrobial agents (Jena et al., 2025). In an era where antimicrobial resistance is a global challenge, identifying plant-derived compounds with antibacterial properties is of paramount importance (Chandrashekar et al., 2025). The present study aims to qualitatively analyze the phytochemical constituents of *D. chinensis* using different solvent extracts and evaluate its antibacterial potential through Minimum Inhibitory Concentration (MIC) assay against *Escherichia coli*. The outcomes are expected to enhance our understanding of the medicinal prospects of this species.

### Methodology

*D. chinensis* was collected from Cuttack district, Odisha, India (Figure 1). The grass species was identified by author followed by published literature (Behera et al., 2025). Whole plant was thoroughly washed under running tap water to remove dust. Further, they were cut into small pieces and air dried. Extraction was made using Soxhlet extraction (Jena et al., 2025). Phytochemical screening was carried out using standard method (Jena et al., 2025). Antibacterial activity was done against *Escherichia coli* (Jena et al., 2025).

### Results and discussion

Qualitative phytochemical screening of *Dinebra chinensis* revealed a consistent presence of reducing sugars across all three solvent extracts (n-hexane, ethanol, and aqueous), suggesting their abundance and solubility across polar and non-polar phases (Table 1). Tannins are known for their protein-binding capacity and antimicrobial potential, which may contribute to the plant's defense mechanism and therapeutic value (Cosme et al., 2025). Saponins and flavonoids were detected exclusively in the aqueous extract, indicating that water is a better solvent for extracting these highly polar compounds. The ethanolic extract uniquely exhibited alkaloids, a class of bioactive metabolites with well-documented pharmacological properties (Adamski et al., 2020). The absence of terpenoids, phenolic compounds, steroids, and carbonyl compounds indicates that *D. chinensis* has a relatively simple secondary metabolite profile, but the presence of tannins, alkaloids, and flavonoids enhances its medicinal relevance (Table 1; Figure 2-4). Minimum

Inhibitory Concentration (MIC) assay against *Escherichia coli* demonstrated no growth (NG) at 100 mg/mL and 50 mg/mL, confirming the bacteriostatic or bactericidal effect of the hydroethanolic extract at these concentrations (Table 2). Growth was observed at 25 mg/mL and below, establishing the MIC value as 50 mg/mL. Therefore, *D. chinensis* not only provides forage biomass but also contributes to animal health by offering natural antimicrobial protection. Its demonstrated antibacterial activity against *E. coli* suggests potential applications in ethnoveterinary formulations for managing gastrointestinal infections in livestock, thereby reducing dependency on synthetic antibiotics, and mitigating the problem of antimicrobial resistance (AMR). Further bioassay-guided fractionation and structural characterization of active compounds could help unlock its full therapeutic potential.

Table 1: Qualitative phytochemical analysis of *Dinebra chinensis*

| Bioactive compounds | n-Hexane | Ethanol | Aqueous |
|---------------------|----------|---------|---------|
| Tannin              | Absent   | Present | Present |
| Saponin             | Absent   | Absent  | Present |
| Flavonoids          | Absent   | Absent  | Present |
| Terpenoids          | Absent   | Absent  | Absent  |
| Phenolic compounds  | Absent   | Absent  | Absent  |
| Reducing sugars     | Present  | Present | Present |
| Steroids            | Absent   | Absent  | Absent  |
| Alkaloids           | Absent   | Present | Absent  |
| Carbonyl compounds  | Absent   | Absent  | Absent  |

Table 2: Estimation of Minimum Inhibitory Concentration against *E. coli*

| Extract                  | Concentration (mg/mL) |    |    |      | MIC (mg/mL) |
|--------------------------|-----------------------|----|----|------|-------------|
|                          | 100                   | 50 | 25 | 12.5 |             |
| <i>Dinebra chinensis</i> | NG                    | NG | G  | G    | 50          |
| Nutrient broth           | NG                    | NG | NG | NG   | -           |
| Microbial broth          | G                     | G  | G  | G    | -           |

(NG = No Growth; G = Growth observed)

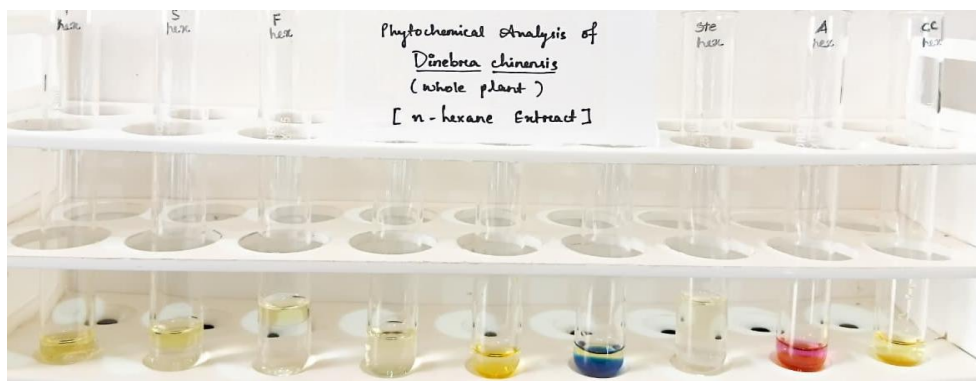


Figure 2: Phytochemical analysis of *Dinebra chinensis* using n-Hexane extract

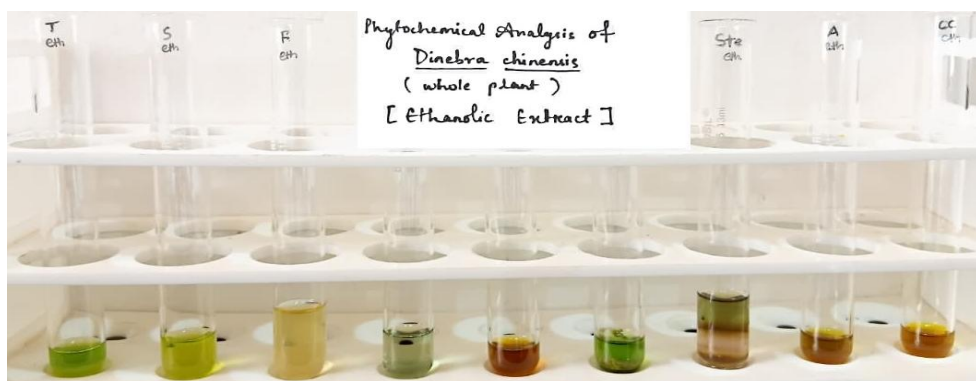


Figure 3: Phytochemical analysis of *Dinebra chinensis* Ethanolic extract

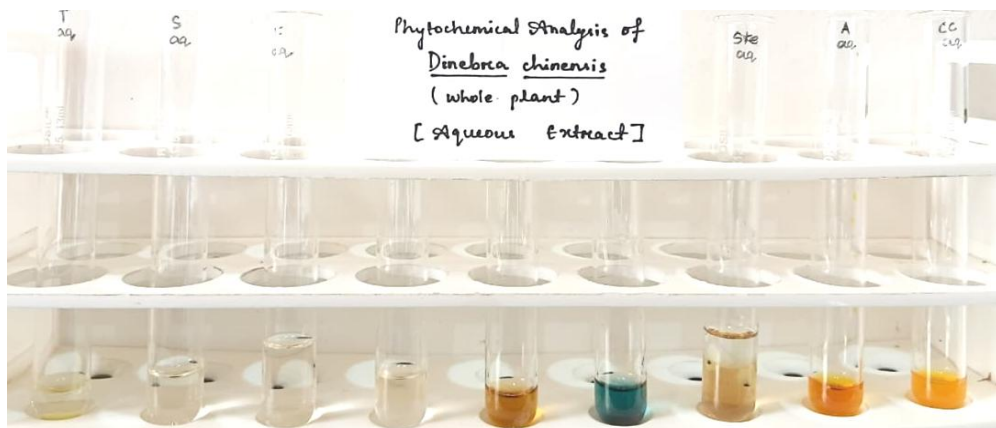


Figure 4: Phytochemical analysis of *Dinebra chinensis* using Aqueous extract

## Conclusion

The present investigation establishes *Dinebra chinensis* as a promising underutilized fodder grass with both nutritional and therapeutic relevance. The presence of tannins,

reducing sugars, saponins, flavonoids, and alkaloids across different solvent extracts highlights its rich phytochemical profile. The hydroethanolic extract exhibited moderate antibacterial activity with a minimum inhibitory concentration (MIC) of 50 mg/mL against *Escherichia coli*, demonstrating its potential as a natural antimicrobial source. These findings support its ethnoveterinary applications for controlling gastrointestinal infections in livestock and reducing reliance on synthetic antibiotics. Future research should focus on bioassay-guided fractionation, isolation, and structural elucidation of active compounds, as well as *in-vivo* validation of its therapeutic efficacy and safety in animal models to integrate this species into sustainable livestock health management strategies.

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